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CHINA REPORT

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BRIEFS

LECTURES BY PRC SCIENTISTS--Hefei, 5 Oct (XINHUA)--In response to a call issued by Fang Yi, president of the Chinese Academy of Sciences, to help the state train talented persons, 149 scientists of the CAS's 18 research institutes in Beijing recently volunteered to deliver lectures at the China Scientific and Technical University or to teach at the university as part-time teachers. These scientists included Wu Zhonghua of the Engineering Thermophysics Institute, Huang Kun of the Semiconductors Institute, and Wu Wenju, director of the Systemic Engineering Institute. A total of 15 of these scientists will deliver lectures at the university within the later half of this year. Xu Jianming, a research fellow of the High Energy Physics Institute and Hu Buwei, an associate research fellow of the Ion Physics Institute are now teaching at the university in Hefei, Anhui Province. [Beijing XINHUA Domestic Service in Chinese 0129 GMT 5 Oct 80]

ZHEJIANG SCIENCE SOCIETY--The preparatory committee for the Zhejiang Provincial Society for studying science and scientific management was formed in Hanzhou on 8 October. Liu Yifu, vice governor of Zhejiang and chairman of the Zhejiang Provincial Scientific and Technological Committee, addressed the inaugural meeting. The preparatory committee is headed by (Liu Caisheng), vice chairman of the Provincial Scientific and Technological Committee. [Hangzhou Zhejiang Provincial Service in Mandarin 1100 GMT 8 Oct 80]

CSO: 4008

APPLIED SCIENCES

THE ABSORPTION OF SOUND WAVES IN CONCENTRATED SUSPENSIONS

Guangzhou ZHONGSHAN DAXUE XUEBAO--ZIRAN KEXUE BAN [ACTA SCIENTIARUM NATURALIUM UNIVERSITATIS SUNYATSENI; ZHONGSHAN UNIVERSITY JOURNAL--NATURAL SCIENCES EDITION] in Chinese No 4, Nov 77 pp 52-59

[Article by Tang Yingwu [0781 2019 0710]]

[Text] Based on McCann's theoretical work, this article considers the constributions to absorption of the dynamic interactions of particles suspended in a sound field and of the volume displacement velocity of the suspension agent relative to the particles, and, from this, the coefficient for sound absorption in a concentrated suspension and the formula for the function of dynamic interactions of particles in suspension in a sound field are derived.

I. Introduction

Research on the laws of absorption in sound waves in concentrated suspensions is practically and theoretically quite meaningful. For example, the muddy sediments on the ocean floor in terms of marine acoustic physics are a kind of concentrated suspension[1]; likewise marine acoustic absorption materials made from metallic filaments are also in a way equivalent to a concentrated suspension.[2] Research in this area has attracted many people's attention, and a lot of work has been done.[3] But in most past theoretical work, the results obtained concerning the interactions of suspended particles in the sound field have been ignored. Experiments have verified that interactions of suspended particles will occur in the sound field if the volume concentration of the suspended particles is not less than 0.8 percent.[4] Suspensions in which there are interactions of particles in the sound field are called concentrated suspensions.

Theoretical research on sound wave absorption in concentrated suspensions is comparatively rare. In 1969, McCann[5] studied the electric force interactions of suspended particles in a sound field, and improved somewhat on Urick's Theory[6]; in 1970 Duykers[7] used a relaxation model to compute the coefficient of sound absorption in a pure kaolin suspension, and his results can better explain Urick's data, but cannot explain Hampton's[8] data too well. The weakness of work done by Duykers is that the physical meaning of the two relaxation times is not clear enough, and that his formulae contain artificial assumptions.

McCann's results[5] offer a better explanation of the dependent relationship of the coefficient of sound absorption to the volume concentration of the suspension in which the volume concentration of particles is not too high (such as less than 20 percent). But when the volume concentration of the suspended particles is greater than 20 percent, there appears a certain discrepancy between the theoretical results and the experimental data, and yet this discrepancy cannot be resolved by a proper theoretical choice of value for the constant ρ. Based on McCann's theoretical work, this article considers the contributions to absorption of the dynamic interactions of particles suspended in a sound field and of the volume displacement velocity of the suspension agent (water) relative to the particles and obtains satisfactory results.

II. Physical Concepts

We hypothesize that concentrated suspension is formed by suspending pure kaolin particles in pure water (abbreviated as water in the following). In a real setting, a suspension is very complicated; there are, for example, the nonuniform sizes of the suspended particles, the irregularity of their shapes, and the probable nonhomogeneous distribution. But under a first-order approximation, a model can be used to represent the realistically complicated situation. In this model:

a) Suspension is formed by equal-sized pure kaolin spherical particles suspended in water. In the absence of a sound field, these small spherical particles exhibit equidistant cubic arrangement in water, forming a cubic lattice;

b) In the presence of a sound field, the wave line (wave-front normal) of the sound wave is perpendicular to a surface of the cubic lattice. Particles situated on the plane perpendicular to the wave line in the sound field vibrate with the same velocity and do not rotate.

This model is illustrated in Figure 1.

Particles are arranged into a cubic lattice in stationary water. Figuratively, we color the particles "black" and "white." White particles are surrounded by black and black by white. The planes of the particles perpendicular to the wave line are shaded.

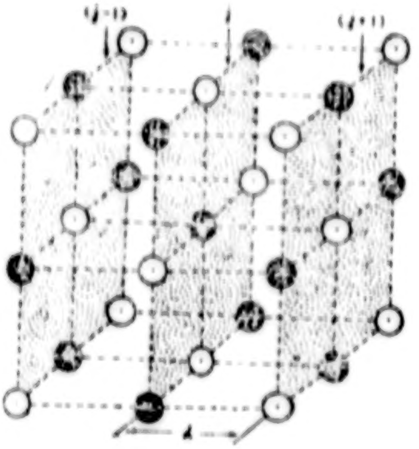


Figure 1.

From the above-mentioned model, we can observe that, in a sound field, those particles situated in the same shaded plane are in a relatively stationary state. Because there exists a difference in velocity between the suspended particles and water in a sound field, thus the "fluid flow-lines" of the black and white particles situated in the same shaded plane in a sound field will contract inwardly. That means each of the white particles will dynamically interact with the closest surrounding black particles in a sound field. Similarly, each of the black particles will interact dynamically with the closest surrounding white particles. Also, because those very small pure kaolin suspended particles carry the same kind of charge, thus there exist interparticle electric force interactions. Because the particles are arranged in the form of a cubic lattice, the interparticle electric force will not be manifested in the absence of a sound field. In the presence of a sound field, the electric force will not appear between black and white particles situated in the same shaded plane. Only between the black (or white) particles situated in the $_i$th shaded plane and the closest white (or black) particles situated in the $(_i-1)$th and the $(_i+1)$th shaded planes will significant electric force interactions be exhibited. In normal circumstances, it is sufficient to compute only the interparticle electric force interactions. These articles will exhibit significant force electric interactions in a sound field because relative displacements take place among them.

To facilitate mathematical manipulations, we compare the dimensions and wavelengths of the suspended particles. Generally, the diameter of the suspended particles of pure kaolin are about $1 \sim 3\mu$, and in suspensions, the wavelength of sound at a frequency of 1 MHz is approximately 0.15 cm (the wavelength of a sound wave in suspension is approximately equal to that in water). Therefore, in the suspensions, 1,000 particles can be accommodated in one wavelength of sound with a frequency equal to or lower than 1 MHz. This implies that, when the volume concentration of the suspended particles is larger than 1 percent, the product of the wave number k of the suspension and the distance d between the centers of the two neighboring particles is far less than 1, i.e.

$$kd \ll 1 \tag{1}$$

The validity of condition (1) greatly simplifies the treatment of the problem; for example, now the contributions to absorption from the scattering attenuation can be ignored.[4] And the chief mechanism for sound absorption in the suspension can be regarded as a viscous drag between the suspended particles and water. In the following, we shall treat the problem as if condition (1) is valid. Experiments show that condition (1) can be relaxed into (4).

$$ka \ll 1 \; , \tag{1'}$$

Where a is the radius of the particles.

III. Mathematical Description

The equation of motion[5,9] in a simple harmonic sound field for a single spherical suspended particle with angular frequency ω (omitting the time factor $e^{-i\omega t}$) is

$$m_p \ddot{x}_p = -m_1 \tau \ddot{x}_u - S\omega m_1 \dot{x}_u + m_1 \ddot{x}_1 \; , \tag{2}$$

where [10]

$$\tau = \frac{1}{2} + \frac{\delta}{4a} \frac{(2n + 3n')^2}{(\eta + \eta' + a\eta/3\delta)^2 + (\eta a/3\delta)^2} \; , \tag{3}$$

$$S = \frac{3}{4}(2\eta + 3\eta')\frac{\delta^2}{a^2} \frac{(1 + a/\delta)(\eta + \eta' + a\eta/3\delta) + (\eta/3)(a/\delta)^2}{(\eta + \eta' + a\eta/3\delta)^2 + (\eta a/3\delta)^2} \; , \tag{4}$$

$\delta = (2\eta/\rho_1\omega)^{1/2}$, η' is the viscosity coefficient of the particle, x_η is the displacement of the particle from the equilibrium position, x_u is the particle's displacement relative to water, x_1 is the displacement of water, m_p is the mass of the particle, m_1 is the mass of water displaced by the particles, η is the coefficient of viscosity of water, ρ_1 is the density of water. Because a pure kaolin particle is hard, i.e. $\eta/\eta' \to 0$, thus, expressions (3) and (4) can be simplified into

$$\tau = \frac{1}{2} + \frac{9}{4a(\omega/2\mu)^{1/2}} \; , \tag{3'}$$

$$S = \frac{9}{4a(\omega/2\mu)^{1/2}}\left[1 + \frac{1}{a(\omega/2\mu)^{1/2}}\right] \; , \tag{4'}$$

where $\mu = \eta/\rho_1$.

Because there exists dynamic interaction among suspended particles in a sound field, this causes considerable attenuation of particle surface resistance (because water also has vibration, the mean velocity of which is greater than that of the particles), even if the vibrational velocity of particles relative to water greatly increases. Assume the incremented multiple to be ψ, then, when one considers the existing dynamic interactions of suspended particles in a sound field, the equation of motion (2) should be revised to read

$$m_p \ddot{x}_n = -\tau m_1 \psi \ddot{x}_u - s\omega m_1 \psi \dot{x}_u + m_1 \ddot{x}_1 \quad , \tag{5}$$

Here ψ is a function of the particle volume concentration V (= $\frac{4}{3}\pi a^3 N$, where N is the number of particles per unit volume). We call this the dynamic interaction function of the suspended particles in a sound field, and in the next paragraph its expression will be derived.

Also because there exist electric force interactions among the suspended particles in a sound field, the electric force thus exerted on the particles has to be added to the left hand side of equation (5). When condition (1) is rigorously satisfied, then the expression (5) for the electric force is $k^2 d^2 \beta x_n$.

$$m_p \ddot{x}_n + k^2 d^2 \beta x_n = -\psi\tau m_1 \ddot{x}_u - \psi s\omega m_1 \dot{x}_u + m_1 \ddot{x}_1 \quad , \tag{6}$$

where β is the interparticle electric force constant. Substituting $x_n = x_u + x_1$

$$U_0 = \frac{-(\sigma - 1 - \beta d^2/m_1 c^2)V_0}{[(\sigma + \psi\tau - \beta d^2/m_1 c^2)^2 + \psi^2 s^2]^{1/2}} \quad , \tag{7}$$

where U_0 is the module for X_u; V_0 is the module for X_1; $\sigma = m_p/m_1$; and c is the velocity of sound in the suspension, which can be approximately calculated from Wood's formula[11]

$$c^2 = \{[(1 - V_c)K_1 + V_c K_p][(1 - V_c)\rho_1 + V_c \rho_p]\}^{-1}$$

In the formula, ρ_1 and ρ_p are densities for water and particicles respectively, k_1 and k_p are the corresponding adiabatic compression coefficients. McCann[5] has pointed out that, as for the ways of arrangement for the previously described particles, $\beta d^2/m_1 c^2$ satisfies the relationship

$$\beta d^2/m_1 c^2 = P V_c^{1/3}, \tag{8}$$

where P is a constant independent of the particle diameter (approximately speaking).

When the V_c of the suspension is larger, one has to introduce the concept of volume displacement velocity of water relative to particles $W = -(1-V_c) X_u$. The second term of the right-hand side of expression (8) is a surface viscous friction experienced by each particle during mutual particle vibrations. Therefore, the particle surface viscous friction F_m per unit volume becomes

$$F_m = -NSm_1\omega\phi X_u = NSm_1\omega\phi\frac{W}{1-V_c} , \tag{9}$$

and the total energy dissipation rate per unit volume becomes

$$\frac{dE}{dt} = F_m W = \frac{NSm_1\omega\phi W^2}{1-V_c} , \tag{10}$$

The time average $\langle dE/dt \rangle$ is then

$$\left\langle \frac{dE}{dt} \right\rangle = \frac{1}{2} NSm_1\omega\phi \frac{W_0^2}{1-V_c} , \tag{11}$$

with $W_0 = -(1-V_c)U_0$.

The total energy per unit volume of sound wave in the suspension[13] is then

$$E_0 = \frac{1}{2}\rho V_k^2 = \frac{1}{2}\rho V_0^2 , \tag{12}$$

with $\rho = (1-V_c)\rho_1 + V_c\rho_2$,

V_k is the module of the effective vibrational velocity[14] of the suspension. Therefore, since the sound amplitude absorption coefficient α induced by the viscous friction is (13)

$$\alpha = \langle dE/dt \rangle / 2CE_0 , \tag{13}$$

substituting expressions (11) and (12) into (13), and observing (7), one can obtain an expression for α

$$2\alpha = \frac{V_c(1-V_c)\omega}{C\rho} \cdot \frac{\rho_1\phi S(\sigma - 1 - PV_c^{1/3})^2}{(S\phi)^2 + (\sigma + \phi\tau - PV_c^{1/3})^2} , \tag{13'}$$

Obviously, as $\phi \to 1$ and $(1-V_c)\rho_1/\rho \to 1$, the above expression can be simplified into McCann's result.[5]

IV. Expression for the Dynamic Interaction Function

Since we only consider the condition in which the dimension of the suspended particle is much smaller than the wavelength of a soundwave in the suspension (such that condition (1) is valid), once the arrangement for the suspended particles is given by the model, this will equate the dynamic interactions experienced by the suspended particles in a sound field to those experienced in a steady motion. Thus, according to similar analysis in the literature,[15] the formula for the vibrational velocity u of water relative to the particles, at a point midway along the line joining the centers of two particles situated on the same shaded plane, is

$$u = u'\left[1 - \frac{3}{4}\left(\frac{6V_e}{\pi}\right)^{1/3} - \frac{1}{4}\left(\frac{6V_e}{\pi}\right)\right] , \tag{14}$$

where u' is the vibrational velocity in the "Stokes flow" at a point which is infinitely distant from the centers of the particles. Because u is the greatest vibrational velocity of interparticle water relative to the particles, the interparticle dynamic interaction expressed in (1), therefore, will attenuate the vibrational velocity of water relative to the particles by a multiple of

$$[1 - \frac{3}{4}(6V_e/\pi)^{1/3} - \frac{1}{4}(6V_e/\pi)]^{-1}$$

One can then derive the expression for the dynamic interaction function ϕ of the spherical suspended particles in a sound field as

$$\phi = \left[1 - \frac{3}{4}\left(\frac{6V_e}{\pi}\right)^{1/3} - \frac{1}{4}\left(\frac{6V_e}{\pi}\right)\right]^{-1} \tag{15}$$

This result can be regarded as a generalization of the result derived in reference[16]; that is, a generalization of the situation of steady motion to cover the situation of fast vibration which satisfies condition (1). Experimental results (indirectly) will verify that this is a quite successful generalization.

V. The Determination of Constant P

In the following, Urick's experimental data will be used to determine the value of constant P. Given a frequency of 1 MHz, Urick has calculated the dependent relationship between the sound absorption coefficient and the particle volume concentration of the pure kaolin suspension, and the calculated results are shown in Figure 2. The physical parameters in the suspension are: $a = 4.70 \times 10^{-5}$ cm, $\nu = 0.01$ cm²/sec, $\rho_1 = 1.00$ gm/cm³, $\rho_2 = 2.65$ gm/cm³, $C = 1.50\times10^5$ cm/sec, $\omega = 2\pi\times10^6$.

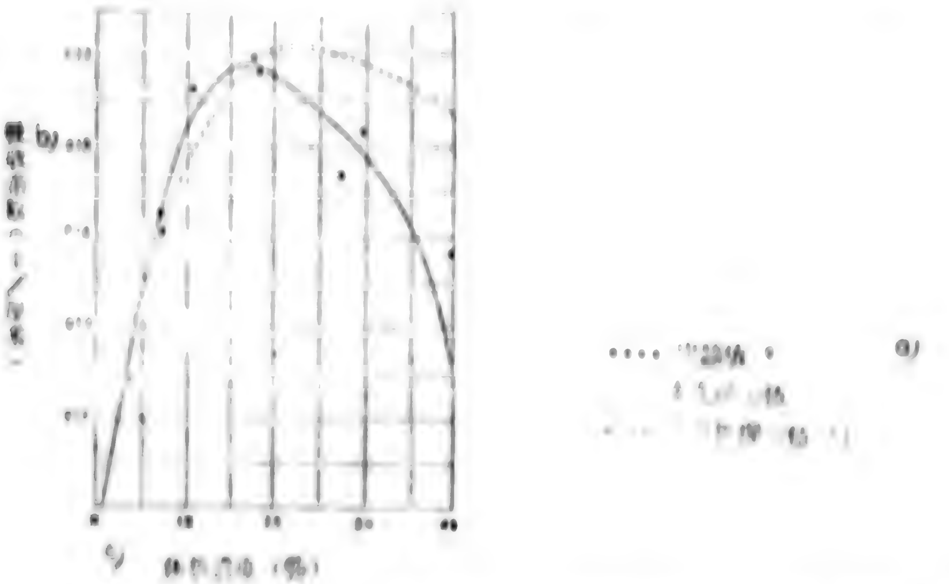


Figure 2: Theoretical and experimental comparison of the dependent relationship to α to V_c at 1 MHz (Note that in Urick's original figure the values of absorption coefficient on the vertical scale are 10 times larger)

Key: a)..... experimental data[6]
— theoretical values from this article
----- McCann's theoretical values[5]
b) absorption coefficient (1/cm)
c) volume concentration (percent)

We selected different P values together with the above parameters to substitute into expression (13') and carried out the numerical calculations. The results show that the characteristic curve for α—V_c (the solid line in Figure 2) obtained when we let P equal 0.7 corresponds to the experimental data. In this way, we have determined P = 0.7, and expression (13') can be written as

$$2\alpha = \frac{V_c(1-V_c)}{C\ \rho}\,\omega\rho_1\,\frac{\phi S(\sigma-1-0.7V_c^{1/3})^2}{(\phi S)^2+(\sigma+\phi\tau-0.7V_c^{1/3})^2}. \qquad (16)$$

The solid line in Figure 2 is calculated by using Eq. (16). From the figure one can see that, except for the region of V_c > 35 percent, the theoretical results obtained in this article satisfactorily correspond to the experimental data. For the sake of comparison, McCann's theoretical results have also been presented in Figure 2 (the dotted line in the figure). Expression (1) is satisfied under Urick's experimental conditions.

VI. Comparison with Hampton's Experimental Data

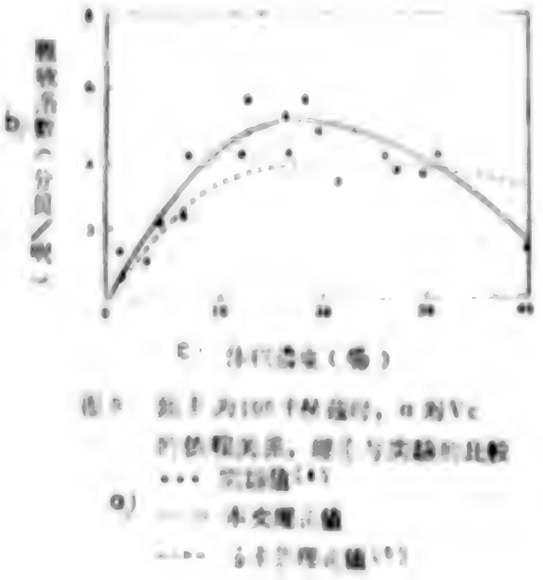
The above section is to determine the constant F, and at the same time to explain Urick's experimental data. Now we compare the theoretical results obtained in this article to Hampton's experimental data.

For the situation in which the particle volume concentration is within the region $0<V_c<0.4$ and the frequency is 1 MHz, Hampton measured the dependent relationship of the sound absorption coefficient of the pure kaolin suspension to the particle volume concentration. In the region of $10\sim10^3$KHz, Hampton also measured the dependent relationship of the sound absorption coefficient of the pure kaolin suspension to the particle volume concentration when the corresponding volume condentrations are 10 and 37 percent. In figures 3 and 4, the black dot and the dot-dash line both represent experimental values; the solid lines represent theoretical values from this article; and the dotted lines represent McCann's theoretical values. Percentages in Figure 4 represent volume concentration of the suspended particles. The physical parameters of the pure kaolin suspension used by Hampton are

ρ_l = 1.00 gm/cm^3 $\qquad$ ρ_p = 2.71 gm/cm^3

η = 10^{-2}cm^2/sec $\qquad$ a = 1.20x10^{-4}cm

K_l = 4.44x10^{-12}cm^2/dyne $\qquad$ K_p = 1.00x10^{-12}cm^2/dyne



Key:

a) ....experimental values[8]
——theoretical values from this article
----McCann's theoretical value[8]

b) Absorption coefficient (db/ft)

c) volume concentration (percent)

Figure 3. A theoretical and experimental comparison of the dependent relationship of a to V_c at 100 KHz

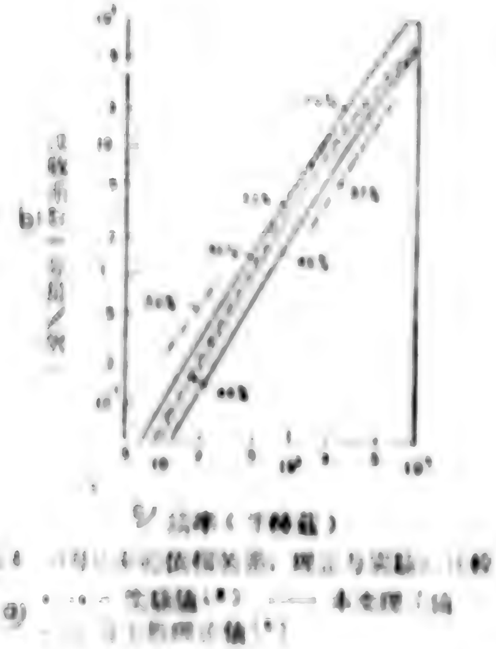


Figure 4. A theoretical and experimental comparison of the dependent relationship of a to frequency

Key: a) ',",' experimental values[9]
—— theroetical values from this article
---- McCann's theoretical values[6]

b) absorption coefficient (db/ft)

c) frequency (KHz)

One can see from these graphs that the correspondence between the theoretical values from this article and Hampton's data is also quite satisfactory, and that ours is better than McCann's theoretical results.

Under Hampton's experimental conditions, expression (1) is satisfied.

VII. Discussion

The P value (0.7) used by us, which was derived from Urick's experimental data, is much smaller than that determined by McCann (1.7), but our theoretical results are better than McCann's. This explains that the contributions to sound absorption in the suspensions from the dynamic interaction and the volume displacement velocity of water relative to the particles cannot be ignored. The reason that the P value determined by McCann is too large is because he relegated the absorption contribution from ψ and $(1-V_c)$ to P.

Under the condition of $kd \ll 1$, we generalize the dynamic interactions function ψ of the steady motion to the situation of fast vibration. Hampton's experiments verify that, within the volume concentration region where $0<V_c\leq 0.4$, this generalization is successful; Urick's experiments show that, within the region of $0<V_c<0.35$, this generalization is successful, but when $V_c>0.35$, the generalization is not valid. From the experimental circumstances, however, Hampton's data seem more reliable than Urick's. Of course, experimental research on this problem is still worth pursuing for high concentration by volume.

When $V_c>0.4$, the model of a cubic lattice arrangement of the suspended particles is no longer appropriate. In this case, one has to consider such factors as the random distribution of particles, the nonuniformity of particles, and the irregularity of shapes. Under these circumstances, to derive a value for ψ from theory will be difficult. It seems that, in determining the value in high concentration regions, one has to use the measured α data and use equation (17)

$$\psi = \frac{MS - 4\tau a n + \sqrt{(MS - 4\tau a n)^2 - 16a^2n^2(S^2 + \tau^2)}}{4a(S^2 + \tau^2)} \qquad (17)$$

to calculate ψ [equation (17) is derived from eq. (16)]. In the equation,

$$M = \omega V_c(1 - V_c)\rho_1(\sigma - 1 - 0.7V_c^{1/3})^2(c\rho)^{-1},$$

$$n = (\sigma - 0.7V_c^{1/3}).$$

From Urick's experimental data (the average value of the experimental points in Figure 2) the empirical formula for ψ can be conclusively calculated to be

$$\psi = \begin{cases} 8.68V_c + 1 & 0 < V_c \leqslant 0.21, \\ 10.5V_c - 0.7 & 0.21 < V_c \leqslant 0.4. \end{cases} \qquad (18)$$

This is the empirical formula we have ordinarily used. Numerical calculations show that expression (14) and expression (18) are the same when $0<V_c<0.35$; when $V_c>0.35$, the ψ value calculated from (14) is much larger than that calculated from (18).

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BRIEFS

YUNNAN SCIENCE, TECHNOLOGY ASSOCIATION--The second congress of the Yunnan Provincial Science and Technology Association opened in Kunming on the morning of 23 September. Some 540 delegates are attending. Li Qiming, Liu Minghui, Gao Zhiguo, Zhu Jiabi, Wang Shaoyan, Yang Kecheng, Wang Qiming, Qu Zhongxiang, (Zhou Zhengyu), (Peng Bi), (Yan Jun) and (Xiao Feng), leading comrades of the Provincial CCP Committee, Provincial People's Congress Standing Committee, Provincial Government, Provincial CPPCC Committee, Kunming PLA units, Yunnan Military District and Kunming Municipal CCP and Revolutionary Committees, attended the opening ceremony. (Liu Shuzhong), vice chairman of the Chinese Science and Technology Association, and responsible comrades of the science and technology associations of Sichuan and Guizhou Provinces and Guangxi Autonomous Region, were invited to take part in this congress. (Li Lifu), responsible person of the Provincial Science and Technology Association, presided over the opening ceremony. (Zhu Ying), vice chairman of the Provincial Science and Technology Association, delivered the opening speech. (Li Yuzhong), responsible person of the Provincial Science and Technology Association, gave a work report at the congress in the afternoon. [Kunming Yunnan Provincial Service in Mandarin 1100 GMT 23 Sep 80]

LIAONING SCIENTIFIC, TECHNOLOGICAL ASSOCIATION--The second committee of the Liaoning Provincial Scientific and Technological Association held its first meeting on 25 September. A total of 111 committee members attended the meeting and elected (Guo Kexin) chairman of the committee. The meeting approved the work system for the second committee of the Provincial Scientific and Technological Association. [Shenyang Liaoning Provincial Service in Mandarin 1100 GMT 25 Sep 80]

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The Structural Pattern of Asia......Liu Hefu [0491 0735 3940] and Wu Zhengwen [0702 2973 2429] (607)

Typing Can Be Quicker than Speaking......Chen Mingyuan [7115 2494 6678], Institute of Acoustics, Chinese Academy of Sciences; Guan Tingjiu [4619 3060 7750], Institute of Biophysics, Chinese Academy of Sciences (612)

A Study of the Coding of Chinese Words......Tian Renhe [3944 0086 0735], Low Energy Nuclear Physics Institute, Beijing Teachers College; Li Zhuhuai [2621 4554 2037], 1141 Institute, Fourth Ministry of Machine Building (615)

On the Transformation Keeping Curvature Invariant and Some Invariance Theorems of Curvature......Liu Shulin [0491 2579 7792], Institute of Mathematics, Chinese Academy of Sciences (632)

Acoustic Field of Water Acoustic Effect from a Laser Beam ......Xia Zhiguo [1115 1807 0948], Li Henian [2621 7729 1628] and Wu Shipei [0702 0099 1014] (632)

A New Mathematical Function Obtained with Boundary Value Problems in Kinetic Theory......Liu Zheming [0491 0772 2494], 11th Research Institute, 7th Ministry of Machine Building (633)

Statistical Distribution of High Energy Photons...... Peng Shouli [1756 1343 4409], Physics Department Laboratory, Yunnan University; Zhao Shusong [6392 2885 2646], Institute of High Energy Physics, Chinese Academy of Sciences (634)

A Semi-Empirical Formula for Force Constant Calculation ......Gao Xiaohui [7559 1321 1863], Changchun College of Geology; Chen Tianlang [7115 1131 2597], Sichuan University (635)

Planck Function of an Open System at Definite States...... Zhu Cansheng [2612 3503 3932], Astrophysics Research Group, Nanjing University (636)

A Study on Applying Insulin to the Anther Culture of Rice ......Gu Jieqing [7357 6043 3237], Plant Protection Office, Shanghai Academy of Agricultural Sciences (637)

A Simple Method for the Differential Staining of Sister Chromatid--U.V. Plus Giemsa Staining......He Weishun [6320 4850 7311], Liu Aihua [0491 1947 5478] and Shi Liming [2457 4539 2494], all of Kunming Institute of Zoology, Chinese Academy of Sciences (638)

The Isolation and Identification of Antitumor Principle Maytansine from *Gymnosporia diversifolia* (Hemsl.) Maxim ......He Zhisheng [0149 4160 2573], Zhou Yunli [0719 7301 7787], Ma Guang'en [7456 1639 1869] and Xu Rensheng [1776 0117 3932], all of Shanghai Institute of Materia Medica, Chinese Academy of Sciences; He Qimin [0149 0366 2404], Huanan Botanical Institute, Chinese Academy of Sciences (639)

9717
CSO: 4008

AUTHOR: SHI Quishi [0670 3061 1395]

ORG: None

TITLE: "The Chu Jiao-6 Trainer Airplane"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 pp 2-3

ABSTRACT: The Chu Jiao-6 trainer airplane is a twin-seat airplane designed to train student pilots. Its preliminary design began in 1957 and it was certified by the Chinese Government in 1961 for mass production. In the Spring of this year, Chu Jiao-6 was exhibited at the Canton Trade Center and for the first time was marketed internationally. The important technical data of the Chu Jiao-6 are as follows: normal take-off weight--1400 kg; normal payload--305 kg; rated engine power--270 hp; maximum speed --287 km/hr; crusing speed--178 km/hr; actual ceiling--5200 km; maximum climb rate--3.9 m/sec; range (at 1000 m altitude)--640 km; take-off distance (paved runway)--280 m; and landing distance (paved runway)--350 m.

AUTHOR: CIU Hung [1508 4767]

ORG: None

TITLE: "Revolving Bore Gun and Revolving Barrel Gun"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 pp 6-7

ABSTRACT: The revolving bore gun and the revolving barrel gun are new aircraft guns with enhanced fire power, firing speed, and improved reliability. The revolving bore gun is used by most Western European countries; it has a firing speed of 1200-1800 rounds per minute; its structure is simple, light weight, and small in size. The revolving barrel gun was developed primarily in the United States; it has a variable firing speed ranging from 2100 to 4200 rounds per minute; its operation is highly reliable, but its structure is relatively heavy and bulky in size. In this article, the operating principle and structural features of each gun are described.

AUTHOR: ZOU Shengquan [6760 4141 6898]

ORG: None

TITLE: "MX- the Mobile Intercontinenetal Ballistic Missile"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 pp 9-11

ABSTRACT: In an effort to regain her superiority in strategic weapons, the United States has decided to develop a new intercontinental missile system called the MX. It is a high precision, 3-stage solid propellant missile to be launched from a mobile platform. It weighs 86 tons and has a throw weight of 3.55 tons; it is 21.3 meters long, 2.3 meters in diameter, and has a range of approximately 11,000 km. A number of different designs of mobile platforms have been proposed for the MX; for example, the ground based cruising platform; mobile platforms transported by highways, railroads, and rivers; the central warehouse mobile platform, the labyrinth type platform with decoy missiles; and platforms hidden in a network of tunnels. After careful analysis, the United States has selected the so-called "runway type" design which allows each MX missile to be launched from one of 23 different platforms connected by concrete tunnels.

AUTHOR: JIANG Zhou [3068 5297]

ORG: None

TITLE: "Heart, Fuel Pump, and Regulator"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 pp 12-14

ABSTRACT: On an aircraft engine, the fuel regulator is used to control the precise fuel supply to the engine which must vary continuously with flight conditions. In this article, the author points out the analogy between the function of a human heart and that of a fuel regulator. A simple experiment is described which illustrates the mechanism of a hydraulic servo motor. In addition, the operations of two particular types of fuel regulators are explained: the constant pressure difference fuel regulator, and the the simple engine speed fuel regulator. (to be continued)

AUTHOR: CHENG Zeng [4453 2582]

ORG: None

TITLE: "Supercritical Wing"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 p 17

ABSTRACT: Supercritical wing is a wing design which results in higher critical Mach number and reduces shock-induced drag at high flight speeds. In contrast to a conventional wing, the supercritical wing has a relatively flat upper surface which allows the air flow to remain supersonic without creating a shock wave over the surface. Supercritical wing design can be used to increase the cruising speed of an airplane, or to increase the range by designing a thicker wing to carry more fuel.

AUTHOR: GAN Benfu [3927 2609 4369]

ORG: None

TITLE: "A Case of Stealing Satellite Secrets"

SOURCE: Beijing HANGKONG ZHISHI [AERONAUTICAL KNOWLEDGE] in Chinese No 4, Apr 80 pp 20-21

ABSTRACT: In November 1978, an American named Canbellus was tried and convicted by the U.S. Federal Court for selling a secret document, the technical handbook for the KH-11 satellite, to the Soviet KGB. Since this incident, a number of articles have appeared in the literature discussing the reconnaissance satellites of the U.S. In this article, the author describes the main features of two specific satellites: the "Big Bird", and the KH-11. The "Big Bird" was built by the Lockheed Co., and was launched into a 184x300 km elliptic orbit with an inclination of 96.3° and a period of 89.1 minutes. It is equipped with high-continuation of HANGKONG ZHISHI in Chinese No 4, Apr 80 pp 20-21

resolution cameras which can send photographic information back to earth in cannisters. The KH-11 satellite was built by the TRW Co., and was placed in a 285x470 km orbit with an inclination of 96.9°. It is equipped with high resolution television cameras which can send information directly to the National Photographic Interpreting Center in Washington, D.C.; its mission time is approximately two years.

3012
CSO: 4009

AUTHOR: CHU Yiqing [5969 0076 3237]

ORG: None

TITLE: "Periodic Solution of Vibration of a Two-Degree-of-Freedom Body with Dampers in which Friction Is Proportional to the Displacement"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 1-11

TEXT OF ENGLISH ABSTRACT: This paper studies a periodic solution of forced vibration of a two-degree-of-freedom body with friction dampers. It discusses the conditions in which the road excitation is simplified to the harmonic support motion and the friction is proportional to the displacement of the body [tank chassis]. First, we derived the differential equation of motion of system. Because of the existence of friction, discontinuous terms with sign function Sgn $(x\dot{x})$ appear in the equation, so there will be some difficulty in solving it. By means of the perturbation method we expand the solution in a power series in a small parameter ε and reduce the sign function Sgn $(x\dot{x})$ to sign function Sgn $(x_0\dot{x}_0)$ of the first approximate solution. Finally, we obtain

[Continuation of BINGGONG XUEBAO No 3, Sep 80 pp 1-11]

the nonresonance periodic solution of the system and come to some conclusions for vibrational properties.

AUTHOR: XIAO Feng [5135 1496]
WEN Shaobai [2429 4801 4101]

ORG: None

TITLE: "Acoustic Locating Techniques for the Burst Point in a Horizontal Plane"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 12-22

TEXT OF ENGLISH ABSTRACT: In this article, the formula for locating the burst point in a horizontal plane is developed on the basis of the assumption of the plane wave; the random error is reduced and the locating accuracy is improved by means of statistical theory and correlation analysis. Finally, the values for the correction corresponding to the original assumption are calculated.

AUTHOR: PENG Zhongji [1756 1813 0679]
WAN Daozheng [8001 6670 2973]

ORG: None

TITLE: "The Synthetic Study of Tetranitroglycoluril and Its Hydrolized Product"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 23-27

TEXT OF ENGLISH ABSTRACT: In 1965~1966, we synthesized a new explosive Tetranitroglycoluril and its hydrolized product 1, 1, 2, 2-Tetranitroethane (TNAE), the latter being a good intermediate to synthesize some other explosives.

TNAE is an unstable compound in H_2O, but its salts of K, Ba are stable. TNAE can react with NH_3, CH_2O to obtain Dinitropentmethylentetramine (DPT) like Methylendinitroamine.

AUTHOR: ZHANG Weiquan [1728 4850 0356]

ORG: None

TITLE: "Research on the Projectile Configurations with Minimum Drag"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 37-44

TEXT OF ENGLISH ABSTRACT: This paper uses the variational method to calculate the configurations of a projectile nose with the minimum drag under the conditions that the sum of nose wave resistance and frictional resistance satisfies the extremes (Euler equation). This paper also analyzes and computes numerically the optimum nose L/D (length-to-diameter ratio), secant parabolic nose and tail contraction ratio and presents the calculated curve.

AUTHOR: CHEN Qingsheng [7115 1987 3932]

ORG: None

TITLE: "Analysis of Movement of Ball Rotor"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 45-55

TEXT OF ENGLISH ABSTRACT: The ball rotor, as an arming and safety device, has found wide application in the fuses for small caliber projectiles used in antiaircraft, aircraft mounted and ship-based guns as well as for recoilless gun projectiles. Its main advantages are that it is simple in structure, easy to manufacture and small in volume. By means of this device we can get an arming delay if the rotational speed of projectiles is low (e.g. $\omega \approx 9000$ rpm). The problem of arming delay may be easily solved if the ball rotor device is combined with a mechanism in which the safety part is made of meltable alloy (e.g., the fuse for small caliber antiaircraft guns). It is the centrifugal moment that causes the ball rotor to rotate, so that it is only used in fuses for spin projectiles whose rotational speed is about 9000-50,000 rpm. The reliability of the function of the ball rotor and the calculations of its arming time are based on the theoretical analysis of its movement. This paper

[Continuation of BINGGONG XUEBAO No 3, Sep 80 pp 45-55]

makes a theoretical analysis of the movement of the ball rotor by means of two non-inertial coordinated systems and introduces the differential equations of the movement of the ball rotor and the calculations of its starting time. Finally, the deviation of the center of the ball rotor from the axis of the projectiles is discussed.

AUTHOR: ZHOU Lanting [0719 5695 1656]
FAN Bingquan [5400 3521 0356]

ORG: None

TITLE: "Behavior of Rigid-Plastic Cylindrical Shell under Explosive Loads"

SOURCE: Beijing BINGGONG XUEBAO [ACTA ARMAMENTARII] in Chinese No 3, Sep 80 pp 56-63

TEXT OF ENGLISH ABSTRACT: The behavior of rigid-plastic cylindrical shells under explosive loads has been studied as has the number solution of shell motion and stress field given in references by Odintsov and Baum. On this basis, this paper makes a further investigation and achieves an analytical solution according to the principle of energy distribution. Therefore, it is simple in calculation, compatible with real conditions and valuable to engineering application.

9717
CSO: 4009

General Science

AUTHOR: YANG Xiangqun [2799 0686 5028]

ORG: Xiangtan University, Hunan

TITLE: "W Transformation and Strong Limit for Denumerable Markov Processes"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 23 No 9, 1980 pp 1092-1109

TEXT OF ENGLISH ABSTRACT: In this paper we present W transformation and strong limit for denumerable Markov processes. g_n transformation and strong limit for denumerable Markov processes were first introduced by Professor WANG Zikun [3769 2737 0981] who successfully solved the construction problem of birth and death processes by using the probabilistic method. Professor HOU Zhenting [0186 2182 2185] applied the g_n transformation to general denumerable Markov processes as well.

AUTHOR: HU Haichang [5170 3189 2490]

ORG: Institute of Spacecraft System Engineering, Chinese Academy of Space Technology, Beijing

TITLE: "On a Variational Principle in the Theory of Dynamic Stability of Elastic Systems"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 23 No 9, 1980 pp 1110-1115

TEXT OF ENGLISH ABSTRACT: The main problem of the dynamic stability of elastic systems is to determine the boundary dividing the stable and unstable regions. This problem seems to be overlooked in the recent development of finite element methods. In the present paper, a variational principle is proposed for the critical parameter which determines the boundary dividing the stable and unstable regions. The proposed functional for the parameter has the classical form of a quotient. By this principle, many finite element methods may be borrowed simply for the numerical solution of various dynamic stability problems.

AUTHOR: None

ORG: Cooperative Research Group of Low Dose Irradiation, Institute of Biophysics, Chinese Academy of Sciences*

TITLE: "Effect of Chronic Irradiation of ^{60}Co- -Ray at Low Dose Rate on Rhesus Monkey (*Macaca mulatta*)"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 23 No 9, 1980 pp 1170-1181

TEXT OF ENGLISH ABSTRACT: This paper briefly presents the results of the systematic observation of the chronic irradiation of ^{60}Co- -ray on the rhesus monkey (*Macaca mulatta*) at a low dosage rate. It also provides valuable experimental data on the estimation of the damage of long-term irradiation on human beings at a low dosage rate.

* Those taking part in this work are the Laboratory of Radiobiology and Laboratory of Biochemistry, Institute of Biophysics, Chinese Academy of Sciences; Occupational Department, Radiation Sickness Research Group, Third Hospital of Beijing Medical College; and Division of Pathological Anatomy, Division of Radiation Medicine, Basic Medical Sciences Department, Beijing Medical College.

AUTHOR: ZOU Gang [6760 1481]
YI Qingcheng [2496 1987 2052]
WU Shixiang [0702 2514 4382]
LU Yixin [7120 0110 0207]
WANG Fansheng [3076 5400 3932]
YU Yuegui [0205 2588 2710]
JI Xinquan [1323 2450 3123]
ZHANG Zuxuan [1728 4371 3551]
ZHAO Dandan [6392 0030 0030]

ORG: ZOU, YI, WU, WANG, YU, JI and ZHAO all of Shanghai Institute of Materia Medica, Chinese Academy of Sciences; LU of Shanghai Research for Hypertension; ZHANG, a visiting investigator from the Department of Biology, Nanjing University

TITLE: "Enkephalin Involvement in Acupuncture Analgesia-Radioimmunoassay"

SOURCE: Beijing ZHONGGUO KEXUE [SCIENTIA SINICA] in English Vol 23 No 9, 1980 pp 1197-1207

TEXT OF ENGLISH ABSTRACT: Since there are several endogenous morphine-like substances differing in distribution and probably also in function, it seems

[Continuation of ZHONGGUO KEXUE Vol 23 No 9, 1980 pp 1197-1207]

necessary to study their roles in acupuncture analgesia separately. Therefore we set up a sensitive and specific radioimmunoassay (RIA) for met- and leu-enkephalin, and employed it in determining the changes of enkephalin contents in the brain regions and CSF during acupuncture. The main results are as follows: (i) Two enkephalins increase markedly in the hypothalamus and striatum during acupuncture analgesia. (ii) Prior intraventricular bacitracin enhances the acupuncture analgesia with concomitant increased contents of enkephalins in the brain and CSF. (iii) Cycloheximide, the protein-synthesis inhibitor, reduces the enkephalin-increasing effect of acupuncture, indicating that one of the mechanisms by which acupuncture elevates the enkephalin levels is the acceleration of biosynthesis. (iv) After surgical isolation of a rat hypothalamus, the effect of electric acupuncture is attenuated. This indicates that the hypothalamus takes part in acupuncture analgesia.

9717
CSO: 4009

Medicine

AUTHOR: DU Ping 2629 1627]
WU Qingxuan [0702 3237 3872]
YANG Rongfen [2799 5554 5358]

ORG: None

TITLE: "Studies on the Translation of Human Leukocyte Interferon Messenger RNA in *Escherichia coli* Cells"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 193-195

TEXT OF ENGLISH ABSTRACT: This paper describes the methods of obtaining and the characteristics of human leukocyte interferon messenger RNA (HLI-mRNA) translated in *Escherichia coli* (*E coli*) strain X-79 cells. The HLI-mRNA was extracted from human leukocytes which were induced by NDV to produce interferon, and *E coli* cells were pretreated with HLI-mRNA. Then HLI-mRNA was added in the presence of DEAE-dextran. The production of an antiviral substance in the *E coli* cells was shown after incubation of the cells with HLI-mRNA. Further analysis showed that: The antiviral substance produced by *E coli* cells was stable at acid pH 2 (treated for 24∼48 hours), possessed interferon of strict

[Continuation of JIEFANGJUN YIXUE ZAZHI No 4, Aug 80 pp 193-195]

species specificity and possessed quite high titre (120∼240 units/ml); unlike animal cells, *E coli* cells, when translating interferon, do not require pretreatment with actinomycin D. The antiviral activity of the substance can be inactivated by trypsin and is resistant to ribonuclease.

Thus, the antiviral substance produced in *E coli* cells in response to exogenously added mRNA-induced human leukocytes has the property of human leukocyte interferon. This procedure may provide a simple and convenient assay system for IF-mRNA and could be applied to the genetic engineering studies concerning interferon.

AUTHOR: CAI Yongzhi [5591 3938 0037]
ZHANG Baoren [1728 1405 0088]
CHEN Rukun [7115 1172 0981]
et al

ORG: None

TITLE: "Studies on the Preparation of Chinese-made Pyrolytic Carbon Tilting-Disc Cardiac Valve and Its Clinical Use"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 196-198

TEXT OF ENGLISH ABSTRACT: This paper presents the characteristic features of a Chinese-made pyrolytic carbon tilting-disc cardiac valve and its preliminary experience of clinical use. Experimental studies, both *in vitro* and *in vivo*, were carried out, and it was proved that the said valve was suitable for clinical trial. It was then implanted in the mitral position in 15 patients. Eight of the twelve survivors have resumed their original work. Three patients died of causes unrelated to the prosthesis. The present results warrant extension of the clinical use of this type of cardiac valve prosthesis.

AUTHOR: ZHANG Taihe [1728 1132 0735]

ORG: None

TITLE: "The Ultrastructural Changes and the Mechanism of Chronicity in Chronic Viral Hepatitis"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 206-208

TEXT OF ENGLISH ABSTRACT: Sixty-five cases of chronic persistent hepatitis (CPH) and chronic active hepatitis (CAH) were studied under both light and electron microscopes. The cisternae of the rough endoplasmic reticulum (RER) were dilated, the ribosomes decreased in number and even dissociated from RER surfaces. Alterations of smooth endoplasmic reticulum occurred throughout the hepatocytes, the lysosomes extensively distributed in the damaged cells, autophagosomes or autophagovacuoles and residual bodies appeared in groups in CPH as well as in CAH. Mitochondria showed irregularity in shape or density, and sometimes several megamitochondria with crystalloid inclusions in their matrix may be seen in CPH. Alterations of bile canaliculi were dilatation of lumen, swelling of microvilli, hydrops and even fragmentation. Other prominent changes were the widening of intercellular spaces and narrowing of Disse's spaces. There were many microvilli protruding into the spaces from the lateral

[Continuation of JIEFANGJUN YIXUE ZAZHI No 4, Aug 80 pp 206-208]

cell membrane of the hepatocytes. The narrowed Disse's spaces were due to hyperplasia and hypertrophy of Ito cells which produced many collagen fibers infiltrating into this space. Lymphocytes infiltrated this space and occasionally contacted the liver cell membranes closely. Liver cells often showed some degree of lytic changes. Based upon these findings, we believe that the cell-mediated immunity was the possible mechanism of injury and chronicity in chronic viral hepatitis, and the narrowing of the Disse's space due to the proliferation and infiltration of collagen fibers into the intercellular spaces may be an additional factor enhancing the chronicity of chronic viral hepatitis.

AUTHOR: WEI Yuanliang [7614 0337 5328]

ORG: None

TITLE: "Medical Treatment of Two Cases of Caisson's Disease"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 209-212

TEXT OF ENGLISH ABSTRACT: Medical treatment of two essential diving accidents was reported. The first one is an acute case of serious decompression sickness due to blow-up to the water surface. Before being blown up to the surface, the patient had spent 35 minutes at 54M. A low blood volume shock and serious decompression sickness with complete transverse spinal cord damage of T_{10} occurred. During the fourth recompression therapy to 10 kg/cm^2, intravenous infusion of low molecular dextran and plasma was given. The low blood volume was successfully improved. The patient inhaled a mixture of 18% O_2-He, and heparin and other medical treatments were used which eventually were successful. The second case suffered prolonged hyperbaric exposure for six and one-half hours resulting from underwater fouling. After receiving a proper decompression schedule, the diver safely returned to normal pressure without suffering from decompression sickness.

AUTHOR: GAO Lanxing [7559 5695 5231]
GU Jingfan [7357 2529 5400]
WANG Zongyin [3769 1350 0603]
et al

ORG: None

TITLE: "The Nutritive Effects of Our Native-Produced Compound Crystalline Amino Acid Infusion Solutions"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 213-216

TEXT OF ENGLISH ABSTRACT: The nutritive effects of the parenteral crystalline amino acid solutions ("771" and "782") prepared in our laboratory were studied in rats by their nitrogen efficiency ratio (NER), net nitrogen ratio (NNR), growth weight, and improvement of nitrogen balances. It was shown that these solutions were superior to the lactalbumin hydrolysate. The "782" model was much better than "771" and was comparable to milk protein.

Clinical studies of 15 cases of various types of protein malnutrition and hypoproteinemia showed that, with the exception of two cases of liver cirrhosis, all other patients have recovered from anorexia, malaise, underweight and other

[Continuation of JIEFANGJUN YIXUE ZAZHI No 4, Aug 80 pp 213-216]

signs. The concentrations of plasma protein of some patients were markedly increased and the edema disappeared. The amount of fluid secreted from the intestinal fistula of one patient was reduced, and the wound healing was accelerated. No adverse effect was noted in any case.

AUTHOR: JIANG Xingjin [5592 5281 6930]
ZHANG Hongru [1728 3163 0320]
LIANG Zenghui [4731 1073 6540]
et al

ORG: None

TITLE: "Preparation and Evaluation of the Rapid Clarificant for Turbid Water"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 217-220

TEXT OF ENGLISH ABSTRACT: A clarificant in powder form is prepared with basic aluminum chloride and polyacrylamide as chief constituents. Salicylic acid, sodium sulfite and dolomite powder are added as stabilizer and disperser. The ordinary dose is 30 mg/l. After adding this clarificant, stir the water for two and one-half minutes and let it settle for two and one half minutes. Then, clarified water with a residual turbidity below 10 mg/l is obtained. Satisfactory clarification can be achieved when the original turbidity of the water is below 2000 mg/l, its temperature above 10°C and alkalinity above 1 mEq/l. In addition, this clarificant can remove more than 98 percent of the bacteria in the water sample.

[Continuation of JIEFANGJUN YIXUE ZAZHI No 4, Aug 80 pp 217-220]

Field tests have been carried out in 15 provinces of our country and satisfactory results obtained. To achieve successful clarification of water of low alkalinity, a small amount of alkali was added. Batches of this clarificant have been produced. Its cost is about the same as that of alum and basic aluminum chloride, or even lower as its effective dose is smaller. It can be stored at room temperature for over five years without deterioration. This clarificant is especially useful for the field treatment of turbid water, and is well accepted by the Army.

AUTHOR: YANG Genyuan [2799 2704 6678]
QI Fengju [7871 7685 5468]
MIAO Guifen [5379 2710 5358]
et al

ORG: None

TITLE: "*In Vitro* Study of Immune RNA of Guinea Pigs After Burns"

SOURCE: Beijing JIEFANGJUN YIXUE ZAZHI [LIBERATION ARMY MEDICAL JOURNAL] in Chinese No 4, Aug 80 pp 221-224

TEXT OF ENGLISH ABSTRACT: It is well known that immune RNA is able to transfer immunologic information of the humoral and cell-mediated immunity from donor cells to recipient cells, but whether the immune response developed in the convalescent stage of animal or human victims after burns can be transferred to recipient lymphoid cells by means of immune RNA is still a problem to be answered. Immune RNA was extracted from lymphoid cells of guinea pigs which were convalescing from burn injuries, and a series of tests on adoptive immunity was carried out with it *in vitro*. It was found that immune RNA is able to transfer rapidly immune responses to the lymphoid cells of normal guinea pigs. It is hypothesized that immune RNA might be used in prevention and treatment of infection and septicemia in burn patients.

9717
CSO: 4009

AUTHOR: None

ORG: Research Group for Two-Dimensional Measuring Instruments, National Institute of Metrology

TITLE: "Two Coordinates Measuring Machine with Laser Interferometer"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 81-92

TEXT OF ENGLISH ABSTRACT: A precise instrument, the two-dimensional measuring machine, has been developed which is based on determining length by means of the laser interference technique.

In this article the main construction of the machine and the four interference systems, including the basic interference system for determining the length, the interference system used for compensating for the Abbe error, the interferometer for measuring small angles and the interferometer for measuring the refractive index of air, are briefly introduced. The method of decreasing the influence of the geometrical error of guides of the instrument for testing and correcting the direction of the moving table in any time is also discussed.

[Continuation of JILIANG XUEBAO Vol 1 No 2, Apr 80 pp 81-92]

In addition, an interpolation method used for measuring dimensions and a two-dimensional-electronic touch probe are presented.

AUTHOR: SHEN Naicheng [3088 0035 3411]
WU Yaoxiang [0702 5069 4382]
SUN Yimin [1327 5030 3046]
AN Jialuan [1344 1367 7762]
WANG Chu [3769 2806]

ORG: SHEN, WU, SUN and AN all of the National Institute of Metrology; WANG of Beijing University

TITLE: "Iodine Saturated Absorption Stabilized He-Ne Laser"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 93-101

TEXT OF ENGLISH ABSTRACT: This report describes the construction and operation of an iodine stabilized He-Ne laser in NIM, and the results of the measurements of frequency stability and reproducibility. Frequency stability is about 2×10^{-11} (1s), 6×10^{-12} (10s) and 2×10^{-2} (100s) respectively. Frequency difference of the two lasers is determined from the measured beat frequencies averaged over components "d" to "j." Frequency reproducibility is better than $\pm 4 \times 10^{-11}$.

AUTHOR: ZHAO Kegong [6392 0344 0501]
ZHANG Xuebin [1728 1331 2430]
ZHAO Jiaqi [6392 1367 3825]
LI Chengyang [2621 2052 7122]

ORG: None

TITLE: "Methane Saturated Absorption Stabilized He-Ne Laser"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 102-107

TEXT OF ENGLISH ABSTRACT: This paper describes the construction and operation of a methane saturated absorption stabilized laser in NIM, and the results of the measurements of frequency stability and reproducibility. Frequency stability is about 3×10^{-12} (1s) and 1×10^{-12} (10s) respectively, and frequency reproducibility is estimated to be $\pm 2 \times 10^{-11}$.

AUTHOR: CHEN Senyuan [7115 2773 0337]

ORG: None

TITLE: "The Cross-Coupling and Parasitic Frequency-Modulating Errors in UHF or Microwave Phase Shift Measurement System"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 108-121

TEXT OF ENGLISH ABSTRACT: This paper describes the theoretical analysis of the cross-coupling and parasitic frequency-modulating errors in the twin-channel heterodyne UHF and microwave phase shift measurement system, and discusses the correct combinations of these errors in various cases.

AUTHOR: ZHANG Zhonghua [1728 6945 5478]

ORG: None

TITLE: "Some Theoretical Studies on the Problem of Superconducting Magnetic Shielding with Application to the Superconducting Current Comparator"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 122-131

TEXT OF ENGLISH ABSTRACT: The macroscopic electrodynamic characteristics of the superconductor as a static magnetic screen have been analyzed in this paper. Based on these studies a new design of superconducting current comparator with high accuracy, simple and easily realizable structure has been proposed. The error due to the existence of the necessary insulating gap of the superconducting screen was also estimated. It has been pointed out that a gap with finite depth will produce a "magnetic resistance attenuation effect" and thus the shielding ability of the screen can be improved appreciably.

AUTHOR: ZHANG Youfeng [1728 6945 5478]

ORG: None

TITLE: "A Calibration Method for the Inductive Current Divider"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 132-141

TEXT OF ENGLISH ABSTRACT: This paper describes an absolute method for the calibration of the complex current ratio of the inductive current divider and the current comparator. The advantages of this calibration method are that the external characteristics of the current divider can be calibrated under actual working conditions and the potential difference between the shields of the reference current transformer and the external connection leads will not affect the calibration results. Thus, this method will be very useful at the higher frequencies where other methods are somewhat constricted. The accuracy of this calibration method is in the order of 10^{-9} of the input.

AUTHOR: TANG Gaohua [3282 7559 5478]
LIN Dawei [2651 1129 5588]

ORG: None

TITLE: "The Precise Coulometric Titration Method in the Determination of the Purity of Sodium Carbonate"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 142-146

TEXT OF ENGLISH ABSTRACT: This paper describes the method and device of precise coulometric titration at constant current used for the determination of the purity of sodium carbonate. The conditions of measurement are stated in detail. By this method the attainable precision is 0.004 percent, and the total uncertainty is 0.005 percent.

AUTHOR: HUA Shihan [5478 1597 7281]

ORG: None

TITLE: "The Data Processing for Pressure Transducers in Dynamic Calibration --A Method of Storage-Trace for Evaluating Phase-Frequency Characteristics"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 147-151

TEXT OF ENGLISH ABSTRACT: This paper presents a storage-trace method for pressure transducers in dynamic calibration. Its special point is that the evaluation of the characteristics of the phase-frequency must be suitably modified by the results evaluated from the formula

$$\Phi(\omega) = tg^{-1} \frac{I(\omega)}{R(\omega)}$$

and this modification must be based upon whether the signs of the real part of the frequency-characteristics of the two adjacent frequencies are identical or not.

The formula described is suitable for calculating by computer. An illustrative example is given.

AUTHOR: LIN Jin [2651 0513]

ORG: None

TITLE: "A Reciprocity Method for the Calibration of Standard Accelerometers"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 152-156

TEXT OF ENGLISH ABSTRACT: A reciprocity method for the calibration of a standard accelerometer and its error are discussed in detail. A comparison of calibration between the reciprocity method and the method using laser interferometer is given. The error is about ± 0.5 percent in the frequency range of 60 Hz to 200 Hz, which is the same as that in the method using the laser interferometer.

AUTHOR: HUANG Zhixun [7806 1807 3169]

ORG: None

TITLE: "Proposal of the Applications of Superconducting Circular-Waveguide Below-Cutoff"

SOURCE: Beijing JILIANG XUEBAO [ACTA METROLOGICA SINICA] in Chinese Vol 1 No 2, Apr 80 pp 158-160

TEXT OF ENGLISH ABSTRACT: The major advantage of the piston-attenuator is that the attenuation constant can be expressed in fundamental units, length and time. But here the finite conductivity of the material used for the waveguide produces a second-order effect on the attenuation constant, and the problem is how to evaluate or remove this effect.

The surface resistance of a superconducting material is near zero. The skin-depth of niobium is very much thinner than the skin-depth of the best conductors in the normal state. Therefore, the superconducting circular-waveguide below-cutoff (SCWBCO) is suitable for the precision piston-attenuator, i.e., the primary standard of attenuation.

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CSO: 4009

Nuclear Physics

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WANG Sufang [3769 4790 5364]
TIAN Yuhong [3944 1342 4785]
et al

ORG: All of the Institute of Modern Physics, Chinese Academy of Sciences

TITLE: "Study of the Fission of the Excited Nuclei Near the Radium"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 2 No 1, Feb 80 pp 19-28

TEXT OF ENGLISH ABSTRACT: The fission phenomena of excited nuclei near the radium formed from 72.5 MeV ^{12}C bombarding with ^{197}Au, $^{nat.}Pb$, ^{209}Bi have been studied by coincidence measurement of the fission fragments.

The results show that they are characterized by the dominance of the mass symmetric fission. The FWHM of the mass distributions are 26.0, 26.9 and 28.2 amu respectively. The average total kinetic energies released by the most probable fission are 159.0, 164.5 and 161.8 MeV, respectively. These results agree with those of the former experiments and the semi-empirical analyses.

[Continuation of YUANZIHE WULI Vol 2 No 1, Feb 80 pp 19-28]

They also agree roughly with Nix's theoretical calculation.

From the analyses of the average total kinetic energies released by the most probable fission, it can be shown that the fission fragments at the moment of scission are not spherical, but partly deformed.

AUTHOR: ZHANG Huanqiao [1728 3562 0829]
XU Jincheng [6079 6210 6134]
LIU Zuhua [0491 4371 5478]
et al

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "The Dependence of Average Numbers of Prompt Fission Neutron of ^{239}Pu on Incident Fast Neutron Energies"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 2 No 1, Feb 80 pp 29-40

TEXT OF ENGLISH ABSTRACT: Average numbers $\overline{\nu}_p$ of prompt neutron for ^{239}Pu fission induced by neutron with energies from 0.1 MeV to 1.5 MeV have been measured by means of a spherical Gd-loaded liquid scintillation counter. The new homemade Gd-loaded liquid scintillator and fast current fission chamber were used in this measurement. In order to obtain the absolute values of $\overline{\nu}_p$, the neutron detection efficiency was calibrated in accordance with (n, p) scattering occurring on a stilbene crystal by collimated monoenergetic fast neutron beam. The experimental data were fitted by a least square method with a straight line $\overline{\nu}_p(E_n) = (2.858 \pm 0.015) + (0.102 \pm 0.017)E_n$.

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LI Guangsheng [2621 1639 3932]
WENG Peikun [5040 1014 3540]
et al

ORG: All of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "The Decay of ^{99}Mo"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 2 No 1, Feb 80 pp 41-46

TEXT OF ENGLISH ABSTRACT: The gamma-ray spectra of ^{99}Mo radioactive decay have been studied by using Ge(Li) spectrometers. The gamma-ray energies and the relative intensities of the 14 main transitions have been measured, and the β-decay branching ratio was deduced.

AUTHOR: LIU Zuhua [0491 4371 5478]
ZHANG Huanqiao [1728 3562 0829]

ORG: Both of the Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "The Distribution of Prompt Neutron Numbers for Long Range α-Particle-Accompanied Fission of ^{252}Cf"

SOURCE: Beijing YUANZIHE WULI [CHINESE JOURNAL OF NUCLEAR PHYSICS] in Chinese Vol 2 No 1, Feb 80 pp 53-57

TEXT OF ENGLISH ABSTRACT: The distribution of prompt neutron numbers (P_v) and average number of prompt neutrons emitted per fission ($\bar{\nu}_p{}^{LRF}$) for long range α-particle-accompanied fission of ^{252}Cf have been measured by means of a large Gd-loaded liquid scintillation counter. The obtained distribution of prompt neutron P_v is in accordance with Gaussian distribution with $\sigma = 1.25$, and the value of $\bar{\nu}_p{}^{LRF}$ is 3.033 ± 0.020.

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CSO: 4009

Petroleum

AUTHOR: YE Lianjun [5509 6647 0193]
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TITLE: "Classification of Sedimentary Basins"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 1-6

TEXT OF ENGLISH ABSTRACT: Classification of sedimentary basins is akin to the purpose of investigation. Therefore, it varies a lot. Our chief interest is laid mainly upon the kind of sedimentary deposits that are relevant to the genetic history of sedimentary basins. To meet this end, we have first differentiated the temporal sequence relationship between sedimentation and basin-forming, and second have given due consideration to the genetic processes of sedimentary basins. Our scheme of classification is roughly as follows:

A. Antecedent Basins:
- A_1. Subaerial antecedent basins;
- A_2. Subaqueous antecedent basins;

B. Growth (or syndepositional) basins:

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 1-6]

- B_1. Flexuring growth basins;
  - (a) Thin crust flexuring basins;
    - (1) Lavatic basin;
    - (2) Eugeosynclinal basin (antecedent basin in its early stage of development);
  - (b) Thick crust flexuring basins;
    - (1) Platform basin;
    - (2) Parageosynclinal basin;
    - (3) Miogeosynclinal basin;
- B_2. Fault growth basins:
  - (a) One-side fault growth basin;
  - (b) Two-side fault growth basin;

C. Secondary Basins:
- C_1. Fault-subsided basin;
- C_2. Remnant synclinal basin;
- C_3. Intermontane basin.

The role of tectonics and the temporal sequence of development and evolution of various sedimentary basins are discussed in this paper. The direct driving force of basin-forming was thought to be in some way connected with local variation and displacement of subcrustal materials.

AUTHOR: SUN Zhaocai [1327 5128 2088]

ORG: The Third Reconnaissance Brigade, Ministry of Geology

TITLE: "The Tectonic Framework and Petroleum Prospectivity of Pre-Mesozoic in the Northern Part of the Eerduos (Ordos) Basin"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 7-17

TEXT OF ENGLISH ABSTRACT: When conducting oil and gas exploration in the Pre-Mesozoic in the northern part of the Eerduos Basin, it should be borne in mind that the basin was once a continental margin. Based on the structural setting in the different stages of tectonic movement, the author divides the region into five structural units from west to east as follows: the Helan fold zone, the Tianhuan synclinal zone, the hinge zone, the monoclinal zone and the Wulanger uplift.

When exploring for oil and gas in the northern part of the basin, the following poinst should be given proper attention:
1) from Ahuzishan to Majiatan, keep an eye on the structure there which is a hinge zone from a slope leading to a deep trough, and from Shanyanjing to Bujianghai fault-depression zone, on the hidden unconformity surface at the

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 7-17]

bottom of the upper and lower Paleozoic and the Shihezi formation;
2) notice the uplift of the lower Paleozoic from Qingyang to Wushenqi and also the middle section of the Helan fold zone;
3) the possibility of the Wulanger uplift being a petroliferous buried hill.

AUTHOR: LIAO Mingshu [1675 2494 2579]

ORG: Institute of Exploration and Development of the Sichuan Petroleum Administration

TITLE: "On Log-Data Processing of Fractured Carbonate Reservoirs"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 19-32

TEXT OF ENGLISH ABSTRACT: This is a study of fractured carbonate oil and gas reservoirs, based on data from actual practice and on a geological model with both a fracture solution cavity system and a porous matrix, with particular emphasis on the different effect of the two systems on fluid flow and the resultant heterogeneity of the influx of filtrates into the pay. A more practical resistivity equation is thus derived as well as the method of finding out the porosity exponent of fractures M_2. Methods of calculating porosity and saturation of the fracture-solution cavity systems under varying saturation conditions are also discussed and are found to be useful in understanding the capability and permeability of the reservoirs, predicting oil and gas well performance and determining the gas-water surface of the reservoirs. They have been applied in some wells for demonstration and analytical purposes.

AUTHOR: HAN Dakuang [7281 1129 0562]
HUAN Guanren [2719 0385 0088]
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TITLE: "Numerical Simulation Study of Water-Flood Performance in a Stratified Oil-Wet Sandstone Reservoir"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 33-48

TEXT OF ENGLISH ABSTRACT: Based on the analysis of abundant field data, the authors have built nearly a hundred simulation models and executed the related numerical calculations. The vertical water-oil displacement in the stratified oil-wet sandstone reservoirs has been studied by analyzing the dynamics of gravitational, capillary and driving forces and the effects of main reservoir characteristics, and from the results obtained in this study interpretations of the character and mechanism of water invasion in some reservoirs in China can be made.

Simulation studies reveal the fact that there exist wide differences of the

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 33-48]

water-oil displacement mechanism between the oil-wet and the water-wet porous media. The paper points out:

1. Regarding the effect of heterogeneity of the reservoir: Quite different characteristics of water-oil displacement can be found due to different vertical permeability distribution. In a positive rhythmic reservoir, the greater the vertical permeability difference, the faster the water channeling, the smaller the thickness of pay flooded, hence the poorer the result of development; on the other hand, in a negative rhythmic reservoir, large difference of vertical permeability will, on the contrary, give better results. The oil-wet nature of the formation makes the difference between the two cases even more prominent.

2. With respect to the mechanism of gravitational, capillary and driving forces: The relationship of waterflood performance and scaling factors of the ratio of gravitational and capillary force is found, and then the effect of the permeability and the thickness of the reservoir on the water-oil displacement is depicted.

3. Regarding the effect of oil-water viscosity ratio: On water-oil displacement it is dealt with both microscopically and macroscopically, i.e., microscopically, increase of this ratio leads to a decrease of displacement efficiency and macroscopically it tends to reduce the sweep thickness. The dominance of one over the other depends on the vertical permeability distributions

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 33-48]

and other characteristics of the reservoir rock.

4. Increasing the production rate to within the practically possible range in a stratified oil-wet reservoir will essentially have no effect on its recovery factor.

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TITLE: "Experimental Verifications on 'A New Hyperbolic Model Equation for Yield-Pseudoplastic Fluids and Related Pressure Drop Formulas'"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 49-57

TEXT OF ENGLISH ABSTRACT: Experimental works have been carried out in three respects to verify those theoretical formulas in the paper entitled "A New Hyperbolic Model Equation for Yield-Pseudoplastic Fluids and Pressure Drop Formulas." As compared with the Herschel-Bulkey model, which also contains three rheological parameters, the hyperbolic model conforms satisfactorily with experimental readings. The pressure drop formulas as derived from this model give accurate results as well as simple calculations. On the other hand, the Herschel-Bulkey model shows its incomparability quite apparently.

AUTHOR: CHENG Wenjiang [4453 2429 3068]

ORG: Exploration and Designing Institute of Petroleum Administration, Sichuan

TITLE: "New Types of Super-Span Pipe Bridges"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 59-72

TEXT OF ENGLISH ABSTRACT: Two new types of super-span pipe bridges are discussed in this paper. One is a suspension pipe bridge of the catenary curve type and the other is a cable stayed pipe bridge. Compared to the conventional suspension pipe bridges, they have the following advantages:
(1) provide the longest span;
(2) no necessity of winding wire systems;
(3) costs lower than of other suspension pipe bridges;
(4) good winding resistance stability and resist vibrations easily with only a few simple wires;
(5) convenient for erection and assembly, not obstructing the normal inland navigation under them.

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 59-72]

This paper briefly describes the component configurations, model tests, design considerations and analyses, as well as erection methods, etc., of these two types of bridges.

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ZANG Jingling [5258 3878 3781]
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ORG: All of Dalian Institute of Chemical Physics, Chinese Academy of Sciences

TITLE: "The Characteristics and Dehydrogenation Reaction Properties of the Pt-Sn Catalysts Prepared by a Complex Method"

SOURCE: Beijing SHIYOU XUEBAO [ACTA PETROLEI SINICA] in Chinese No 3, Jul 80 pp 73-79

TEXT OF ENGLISH ABSTRACT: The Pt-Sn catalysts with the -Al_2O_3 support have been used as the catalyst for the dehydrogenation of long chain n-paraffins to produce mono-olefins.

It has been found in our investigation that the catalyst prepared by a new method to improve the interaction between Pt and Sn has higher stabilities than does that prepared by the conventional method with the same composition of Pt and Sn. In order to characterize the surface structures and the

[Continuation of SHIYOU XUEBAO No 3, Jul 80 pp 73-79]

reaction properties of these catalysts, the characteristics of two Pt-Sn catalysts prepared by different methods were studied by means of the Mossbauer spectroscopy, TPD of H_2, and reaction kinetics study of cyclohexane dehydrogenation. These experiments give the evidence that the interaction between Pt and Sn may be improved if the catalyst is prepared by the complex method. The stabilities of these catalysts are obviously enhanced and the energy of activation of dehydrogenation is much higher than that of the catalyst prepared by the conventional method. These results show that this type of catalyst will be superior to the conventional commercial Pt-Sn catalyst if it is used in the process of mono-olefin production.

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CSO: 4009

Physics

AUTHOR: ZHANG Yuheng [1728 5940 1854]

ORG: Department of Physics, University of Science and Technology of China

TITLE: "Theory of Optimum Designing for the Systems of Pulse Strong Magnetic Field"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 29 No 9, 1980 pp 1121-1134

TEXT OF ENGLISH ABSTRACT: After comprehensive consideration of the factors of coil, circuit and power, this article gives, for the first time, a general theory of designing a standard capacitor discharge pulse magnet (winding coil, Bitter coil or single turn coil). According to the theory, the optimum construction parameters of the magnet and the parameters of the power (i_0, $F(\alpha, \beta)$, a_2, b, L, C, N, l, S, (or d), R and I_{max}) can be calculated if only the figures of B_0, 2a, 1/2 T, λ, σ and v are given.

This article also makes a physical study of the optimum construction of a magnet.

AUTHOR: XU Jinkui [6079 6855 1145]

ORG: Institute of Atomic Energy, Chinese Academy of Sciences

TITLE: "The Total Yield and Energy Spectra of the Secondary Particles of Thermonuclear Reaction"

SOURCE: Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 29 No 9, 1980 pp 1151-1157

TEXT OF ENGLISH ABSTRACT: Starting from the basic formulism of nuclear reaction kinematics, the general expressions of the total yield and the energy spectra of the secondary particles of thermonuclear reactions in plasma with the Maxwellian velocity distribution of ions have been derived. The possibility of using the neutron and charged particles as a tool of plasma diagnostics is also discussed.

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CSO: 4009

AUTHOR: JIANG Zhaofu [3068 0340 1381]

ORG: None

TITLE: "Body-Temperature of Artificial Satellites"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 9, Sep 80 pp 10-11

ABSTRACT: Just as human beings maintain a constant body temperature by altering the attire during varying temperatures of summer and winter, an artificial satellite must also maintain an optimal body temperature to guarantee itself and all the instruments it carries to operate normally. This is especially important in case of manned satellites. The sealed cabin of the astronauts must be of a temperature and pressure condition suitable for them to live and work. This paper explains the need and the techniques of temperature controlof artificial satellites and space vehicles.

AUTHOR: HOU Wentao [0230 2429 3447]

ORG: Institute of Applied Chemistry, Chinese Academy of Sciences

TITLE: "Frightening Corrosion of Metals"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 9, Sep 80 pp 18-20

ABSTRACT: Although corrsion is a common phenomenon and everyone knows what it means, not very many have ever heard of the fact that the loss of steel and iron due to corrosion of equipment in the 2 countries of USA and USSR is estimated to be 40,000,000 tons a year. Of this, 10,000,000 tons are such total loss that reclamation is not possible. This amount of steel materials is sufficient to construct 1750 ships of 10,000 tons each or to build 75 railroad tracks each the length of Beijing-Shanghai Railway. The reasons for metals to corrode and techniques of controlling corrosion are discussed.

AUTHOR: WANG Guyan [3769 6253 1484]

ORG: None

TITLE: "The World of Living Things--Teachers of Designers"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 9, Sep 80 pp 22-24

ABSTRACT: Although human designers seem to be so capable as to create airplanes, submarines, and various automatic machines and they have even sent men to the moon, they, in fact, have learned a great deal from birds, animals, fishes, etc. mere creatures of the world of living things. This paper tells the stories of how wings of the dragonfly taught designers how to control wing tremor of airplanes, how the body-shape and skin structure of dolphins inspired designers to find new ways of building faster ships, how kangaroos taught designers to make wheelless cars to run on desert and undurated fields, and how mechanical principle of human joints and muscles taught designers to make the walking machine, etc.

AUTHOR: HAN Jizhang [7281 1323 3864]

ORG: None

TITLE: "New Water-Saving Equipment--Glass Steel Cooling Tower"

SOURCE: Beijing KEXUE SHIYAN [SCIENTIFIC EXPERIMENT] in Chinese No 9, Sep 80 p 41

ABSTRACT: In recent years, round, white, tower-like structures are often observed perched atop factories in such cities as Shanghai, Guangzhou, etc. They are new water-saving equipment made of glass steel [glass fiber reinforced plastic] for recycling and cooling the water having been used in the production process as a heat exchange medium. Although the temperature of the water is raised in the production process, the quality is unchanged. In the past, the cooling towers are made of wood, cement, or steel, with natural ventilation for cooling. The glass steel material is more resistant to rot, acids, water, alkaline, corrosion, etc. while the countercurrent type cooling mechanism is also more efficient. A drawing depicting 2 such cooling towers is included.

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